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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/531,112	04/13/2005	Yoichi Nakagawa	MAT-8681US	2581

23122 7590 09/08/2006

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EXAMINER	
AU, GARY	

ART UNIT	PAPER NUMBER
2617	

DATE MAILED: 09/08/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/531,112	NAKAGAWA ET AL.	
	Examiner	Art Unit	
	Gary Au	2617	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 June 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 and 3-10* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1 and 3-10* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 June 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. The Art Unit location of your application in the USPTO has changed. To aid in correlating any papers for this application, all further correspondence regarding this application should be directed to Art Unit 2617.

Response to Amendment

2. Applicant's arguments with respect to claims 1 an d 3-10 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 6,996,380 (Dent) and further in view of US Patent No. 6,850,741 Lei et al. (Lei).

Considering claim 1, Dent teaches a transmitter apparatus (base stations 12 – figure 1, col. 5 lines 9-25) for transmitting an information symbol sequence (information signals s1-s3 – figure 1, col. 6 lines 35-47) from a first radio station having an array antenna (antennas 14A-14C – figure 1, col. 6 lines 9-25) having M (*M is a positive integer and* M>1) elements to a second radio station (col. 6 lines 9-25), the transmitter

apparatus comprising: vector control means for producing a plurality of N (N is a positive integer) dimensional vectors, *where N <= M* (channel estimate matrix, col. 6 lines 35-47); and vector multiplexing means for producing *an M number of* vector-multiplexed symbol sequences multiplexed by multiplying the plurality of N dimensional vectors *by* a plurality of symbol sequences containing the information symbol sequence and *for* transmitting *the vector-multiplexed symbol sequences* through the array antenna (col. 10 line 47 – col. 11 line 2); *and* the vector control means produces the plurality of N dimensional vectors such that, at the second radio station, at least one symbol sequence containing the information symbol sequence is received *from* among the plurality of symbol sequences *and* other symbol sequences canceled (col. 6 lines 35-47). However, Dent fails to teach the vector control means produces the plurality of N dimensional vector based on a propagation parameter corresponding to a propagation channel between the first radio station and the second radio station independent of other propagation channels.

In an analogous art, Lei teaches the vector control means produces the plurality of N dimensional vector based on a propagation parameter corresponding to a propagation channel between the first radio station and the second radio station independent of other propagation channels (equation 3 and 4, col. 3 lines 9-62).

It would have been obvious for one of ordinary skill in the art at the time the invention was made to modify Dent's system to include the vector control means produces the plurality of N dimensional vector based on a propagation parameter corresponding to a propagation channel between the first radio station and the second

radio station independent of other propagation channels, as taught by Lei, for the advantage of estimating channel coefficients (col. 3 lines 52-62).

Considering claim 3, Dent teaches propagation channel analyzing means for producing a propagation channel matrix as the propagation parameter (channel estimate matrix, col. 6 lines 35-47), wherein said vector control means produces a plurality of N dimensional vectors of the correlation matrix of the propagation channel matrix (col. 10 line 47 – col. 11 line 2) but fails to disclose it is based on singular-value decomposition.

In an analogous art, Lei teaches singular-value decomposition (col. 2 lines 35-50).

It would have been obvious for one of ordinary skill in the art at the time the invention was made to modify Dent's system to include eigen-value decomposition, as taught by Lei, for the advantage of improving downlink performance (col. 2 lines 35-50).

Considering claim 5, Dent teaches reference symbol producing means for producing a reference symbol known to the second radio station; and propagation channel information receiving means for receiving information *associated with the* propagation parameter transmitted from the second radio station and *for* determining the propagation parameter *from the received information*, wherein the information *associated with the* propagation parameter is produced from the propagation parameter, *the propagation parameter being determined by* the second radio station from the

reference symbol transmitted from the first station (channel estimate matrix, col. 6 lines 35-47).

Considering claim 6, Dent teaches the plurality of symbol sequences (information signals s1-s3 – figure 1, col. 6 lines 35-47), are, *in part of all,* symbol-mapped based on modulation schemes different from *each other* (col. 8 lines 32-60).

Considering claim 7, Dent teaches the plurality of symbol sequences (information signals s1-s3 – figure 1, col. 6 lines 35-47), are, *in part of all,* spread by code sequences different one from *each other* (col. 8 lines 32-60, where the system is a CDMA network and all CDMA system identifies users with a unique code).

Considering claim 8, Dent teaches a radio communication (figure 1, col. 5 lines 9-25) method for transmitting an information symbol sequence from a first radio station having an array antenna having M elements to a second radio station, *where M is positive integer and M>1* (col. 6 lines 9-25), the radio communication method comprising *the steps of*: *producing* a plurality of N dimensional vectors *by the first radio station, where N is a positive integer and N<=M* (channel estimate matrix, col. 6 lines 35-47), such that, at the second radio station, at least one symbol sequence containing the information symbol sequence is received *from* among plurality of symbol sequences containing the information symbol sequence and other symbol sequences are canceled (col. 6 lines 35-47); multiplying the plurality of N dimensional vectors *by* the plurality of

symbol sequences containing the information symbol sequence and producing *an M number of* vector-multiplexed symbol sequences; and transmitting the vector-multiplexed symbol sequences from the first radio station to the second radio station through the array antenna (col. 5 lines 9-25). However, Dent fails to disclose the step of producing the plurality of N dimensional vectors produces the plurality of N dimensional vectors based on a propagation parameter corresponding to a propagation channel between the first radio station and the second radio station independent of other propagation channels.

In an analogous art, Lei teaches the vector control means produces the plurality of N dimensional vector based on a propagation parameter corresponding to a propagation channel between the first radio station and the second radio station independent of other propagation channels (equation 3 and 4, col. 3 lines 9-62).

It would have been obvious for one of ordinary skill in the art at the time the invention was made to modify Dent's system to include the vector control means produces the plurality of N dimensional vector based on a propagation parameter corresponding to a propagation channel between the first radio station and the second radio station independent of other propagation channels, as taught by Lei, for the advantage of estimating channel coefficients (col. 3 lines 52-62).

Considering claim 9, Dent teaches transmitting a reference signal from the second radio station to the first radio station, *the reference signal including a reference symbol known to the first radio station*, wherein the first radio station calculates *the*

propagation parameter based on the reference symbols (channel estimation matrix, col. 6 lines 35-47).

Considering claim 10, Dent teaches a radio communication (figure 1, col. 5 lines 9-25) method *for* transmitting an information symbol sequence from a first radio station having an array antenna having M elements to a second radio station, *where M is a positive integer and M > 1* (col. 6 lines 9-25), the radio communication method comprising the steps of: transmitting (antennas 14A-14C – figure 1, col. 6 lines 9-25) a reference signal *from the first radio station to the second radio station, the reference signal* containing reference symbols known to the second radio station (channel estimate matrix, col. 6 lines 35-47); *producing* a channel information symbol sequence *by the second radio station from the received reference signal* (channel estimate matrix, col. 6 lines 35-47); transmitting the channel information symbol sequence from the second radio station to the first radio station (col. 5 lines 9-25); *producing* a plurality of N (N is a positive integer) dimensional vectors *by the first radio station, where N <= M* (channel estimate matrix, col. 6 lines 35-47), such that, at the second radio station, at least one symbol sequence containing the information symbol sequence is received *from* among a plurality of symbol sequences containing the information symbol sequence *and* other symbol sequences are cancelled, based on the propagation parameter extracted from channel information symbol sequences received *by the first station* (col. 6 lines 35-47); multiplying the plurality of N dimensional vectors *by* the plurality of symbol sequences containing the information symbol sequence and

producing *an M number of* vector-multiplexed symbol sequences (col. 5 lines 9-25); transmitting the vector-multiplexed symbol sequences, from the first radio station to the second radio station *through the array antenna* (col. 6 lines 35-47). However, Dent fails to teach the channel information symbol sequence containing a propagation parameter corresponding to a propagation channel between the second radio station and the first radio station independent of other propagation channels.

In an analogous art, Lei teaches the vector control means produces the plurality of N dimensional vector based on a propagation parameter corresponding to a propagation channel between the first radio station and the second radio station independent of other propagation channels (equation 3 and 4, col. 3 lines 9-62).

It would have been obvious for one of ordinary skill in the art at the time the invention was made to modify Dent's system to include the vector control means produces the plurality of N dimensional vector based on a propagation parameter corresponding to a propagation channel between the first radio station and the second radio station independent of other propagation channels, as taught by Lei, for the advantage of estimating channel coefficients (col. 3 lines 52-62).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 6,996,380 (Dent) and US Patent No. 6,850,741 Lei et al. (Lei) as applied to claim 1 above, and further in view of US Patent No. 6,463,105 (Ramesh).

As to claim 4, Dent teaches propagation channel analyzing means for producing a propagation channel matrix as the propagation parameter (channel estimate matrix, col. 6 lines 35-47), the vector control means being to produce a plurality of N dimensional vectors of the propagation channel matrix (col. 10 line 47 – col. 11 line 2) but fails to disclose it is based on eigen-value decomposition (equation 7, col. 7 line 64 – col. 8 line 7).

In an analogous art, Ramesh teaches singular-value decomposition (col. 2 lines 42-53).

It would have been obvious for one of ordinary skill in the art at the times the invention was made to modify Dent's system to include singular-value decomposition, as taught by Ramesh, for the advantage of giving good performance (col. 2 lines 42-53).

Conclusion

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gary Au whose telephone number is (571) 272-2822. The examiner can normally be reached on 8am-5pm Monday to Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lester Kincaid can be reached on (571) 272-7922. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

GA

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